Agricultural Economics Research

JANUARY 1970 Vol. 22, No. 1

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UNITED STATES DEPARTMENT OF AGRICULTURE ● Economic Research Service

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A mimeographed index for Volume 21 is now available from the Division of Information, Office of Management Services, U.S. Department of Agriculture, Washington, D.C. 20250.

Agricultural Economics Research

A Journal of Economic and Statistical Research in the United States Department of Agriculture and Cooperating Agencies

JANUARY 1970 Vol. 22, No. 1

Pricing Systems and Agricultural Marketing Research

By George B. Rogers

Both Irwin (20)[1] and Breimyer (4) have recently labeled pricing a central and major problem in agricultural marketing. Prices have a fundamental role in both long-run and short-run decision making at all levels in an industry. In the long run, prices should optimize resource allocation and consumer satisfaction. In the short run, they should facilitate trading and the orderly and timely movement of goods from producers to ultimate users.

Prices are generated by a pricing system. Within such a system, the process of price making is hardly passive but involves deliberate effort. Moreover, the general type of pricing system in operation, its individual characteristics, and the conduct of active participants in the system, all influence its performance.

This article delineates a framework for examining pricing systems. It suggests a general classification of pricing systems, describes some pertinent characteristics, and lists some measures of performance in such systems. It summarizes the current pricing systems for selected agricultural commodities and suggests some research problems which might command the attention of agricultural economists.

Pricing systems have received less attention than many other areas of agricultural marketing research. A better understanding of the nature of pricing systems and their problems might stimulate more specific research on agricultural pricing systems and facilitate orderly improvements in pricing.

Classifying Pricing Systems

Various authors have discussed pricing practices, techniques, objectives, or policies, and pointed out examples applicable in particular industries. Such discussions do not provide a comprehensive framework for classifying pricing systems, but they furnish details useful in developing a classification.

Bain indicated that in most markets sellers approach price-output problems by calculating and announcing selling prices, and that the alternative policy of determining output and "letting price take care of itself" is found usually only in industries of relatively atomistic structure. There, the individual seller faces a well-publicized going market price for all industry output, which may result from procedures such as the operation of a highly organized central market or the domination of the market by a few large buyers who simply determine and announce a fixed buying price. Examples cited were mainly extractive industries like those in agriculture, lumbering, and crude petroleum production (2, p. 269-270).

Clark divided price making into three main types and a larger number of special types. The three main types were (1) supply-and-demand pricing, (2) the quoted price, and (3) the negotiated price. Special forms and hybrids included remainder and disposal sales, sales of secondhand goods, auctions, buying on sealed bids, negotiated departures from sellers' quoted prices, and quoted or negotiated prices subject to revision under specific contingencies. Supply-and-demand pricing was held to be most clearly seen on organized exchanges. Under the quoted price system, the seller offers a price at which he expects to fill whatever orders come. The two main forms of negotiated prices were illustrated by the real estate market and collective bargaining by organized labor (6, p. 108-110).

Macklin listed three general methods of price-making in agriculture: (1) calculation, (2) organized speculation, and (3) hit-or-miss guessing or chance juggling of market forces. With sufficiently complete information on both supply

[1] Underscored numbers in parentheses indicate items in the Selected References, p. 10.

and demand conditions, an integrated marketing concern could calculate relatively stable prices that would both guarantee buyers against declining or violently fluctuating prices and promote sales and competition. With many firms involved in a complex marketing system, "organized speculation is preferable to prices based on pure guessing." But with uncertainty existing, "the judgments of many are safer and less speculative than the judgments of only a few" (23, p. 325-331).

Nourse classified pricing mechanisms into three types: (1) "authoritarian," (2) "administered," and (3) "automatic." Examples of the "authoritarian" form included public utility regulation, railroad rate control, the Guffey coal acts, and both Federal and State milk controls. (One could also include wartime price controls.) "Administered" pricing included the major part of modern industrial life, with its large corporate producers, chainstores, trade associations, collective bargaining unions, and cooperative organizations. The "automatic" type covered the simple, natural, flexible kind of prices emerging spontaneously in free markets patronized by individual, unorganized producers and buyers (29, p. 9-21). Many agricultural products have traditionally been classified under the "automatic" type.

Nourse's classification is a broad and particularly useful one. Yet the term "automatic" is somewhat misleading, since pricing is not an effortless and unstructured process even under approximations of pure or atomistic competition.

Pricing at retail is basically administrative, since retailing fits into monopolistic competition theory. Yet retail pricing is a somewhat special case, particularly in chainstores handling thousands of items. Preston indicated that (1) retail prices are often set according to established markups over invoice costs, but (2) these markups are not generally uniform among products or items and are varied on individual items from time to time based on merchandising decisions and in response to local competitive pressures (30, p. 1, 40, 68).

Nelson and Preston subsequently labeled as "variable-price merchandising" the simultaneous and sequential manipulation of selected prices upward and downward in order to draw attention to the market offerings of the firm and to differentiate them from those of its competitors. This practice is characteristic of multiproduct firms and, in the study in question, particularly of large food chainstores. The environment is clearly an "imperfect" one, differing from both perfect competition in the abstract and tightly knit oligopoly or monopoly (28, p. 4-5, 103).

Hawkins discussed various kinds of "market pricing policies" he held to be special cases of the general theory of monopolistic competition. These were "odd prices," "psychological pricing," "customary prices," "pricing at the market," "prestige pricing," "price lining," "resale price maintenance," "quantity discounts," and "geographic pricing" (18, p. 233-240). One could add such terms as f.o.b. basing point pricing, delivered prices for certain zones, or destination prices less transportation and handling charges. In the context of this article, few of these are policies or goals. Many are methods, customs, or simplifying techniques. Some could be used under several competitive structures.

Table 1 classifies pricing systems with competitive situations varying from monopoly toward atomistic competition. The main types of systems, some of the methods or aids to establishing prices, and some possible pricing goals and policies are specified.

Characteristics of Pricing Systems

Pricing systems have definable characteristics. Some characteristics are common to all pricing systems. Other characteristics are peculiar to particular industries.

The general type of pricing system which prevails is closely related to the competitive structure of the industry (table 1). In this connection the most relevant measure is the extent of concentration of firms, typically measured by the number and size of units.

Differentiated pricing is a feature affected by both prevailing competitive structure and individual industry characteristics. A high degree of price differentiation is likely in competitive structures from monopoly through monopolistic competition, except possibly in some basic extractive and processing industries. In general, the higher the degree of processing or the more complex the manufacturing, the

Table 1.--A general classification of pricing systems [1]

Competitive structure (from less to more competitive in type)	Type of pricing system	Representative methods or aids in establishing prices	Some pricing goals and policies [2]
Public monopoly	Authoritarian	Boards, comittees, public or quasi-public agencies (announced and/or approved lists), Governmental agreements, negotiation.	Rate of return on investment. Discriminatory (classified). Foreign trade policies. Government price support.
Private monopoly	Authoritarian	Committees, individuals (annnounced or private lists, or individually quoted).	Profit maximization. Target rate of return. Perpetuation. Discriminatory (differentiation).
Oligopoly	Administered	Committees, individuals, trade associations, agreements among participants, price leadership (announced or private lists, or individually quoted).	Status quo, or change market shares. Predatory price-cutting. Profit maximization. Target rate of return. Sales maximization. Discriminatory (differentiation).
Monopolistic competition	Administered	Committee, price maker or merchandising manager, trade organization, manufacturer's suggested prices, negotiation.	Customary markups. Variable price merchandising. Meet local competition.
Atomistic competition	"Automatic," free, or open market	Terminal markets, country point buying, exchanges, base quotations, auctions, committees, contracts, buyer announcements, negotiation.	Make the best deal you can or take the going market value as established by someone else.

[1] Applies only where facilitating exchange of goods is intended objective. Futures markets are thus excluded, although trading results can contribute to cash market price determination.

[2] These represent possible courses of conduct open to firms or groups of firms.

greater the likelihood of widespread differentiation of prices along product lines. In the public monopoly grouping and to some extent in the private monopoly grouping, price differentiation by type of buyer may be more likely. Where the degree of pure or atomistic competition is high, price differentiation is not likely to be too significant. In the context of this discussion, generally used or recognized grades and standards do not constitute meaningful differentiation in terms of pricing systems.

Pricing systems encompass both the determination of basic price levels and translation activities which depart from basic levels through the application of premiums, discounts, and other adjustments. But it is characteristic in each industry that one level of trading is of key importance in the determination of basic price levels.

Price followers, as well as basic price makers, may use basic values for a few grades, sizes, geographic locations, trading levels, and quantities and terms of sale to determine prices for other grades, sizes, geographic locations, trading levels, and quantities and terms of sale. Usually such prices are determined by applying

premiums or discounts renegotiated or redetermined only infrequently and/or on the basis of longer run changes in costs, rates, and techniques.

The basic price level tends to be established at a level of manufacturing, processing, or distribution where the product has reached a form essentially like that in which it will reach the ultimate consumer or user. Some examples might be the manufacturing of automobiles, furniture, clothing, steel products, or appliances, the canning or freezing of foods, or the processing of broilers from live to ready-to-cook form.

For many other agricultural products, the key trading level may be the level of sale to wholesalers, processors, or retail buyers. Producer prices are often determined by discounting from such levels. Many retail prices may be determined by markups over cost, including "fair trade prices" or "manufacturer's suggested retail prices." On the other hand, retail prices and margins often reflect local competitive conditions and variable pricing policies, including the use of food items as advertised or unadvertised specials.

Typically, only a few participate in the process of determining basic price levels, irrespective of the prevailing competitive structure.

It is easy to visualize this characteristic in industries where concentration ratios are high. In industrial and service sectors, price making readily becomes a specialized function, because specialization follows with scale or because there is often a vast number of items to be priced. In other instances, the basic price making role also is delegated, but largely for other reasons.

Even where competition is relatively atomistic, many potential participants tend to be effectively excluded because they do not possess enough market information or expertise to participate, because being price followers enables them to concentrate on operational, assembling, and distributive functions, or even because they cannot readily gain entrance to key institutions. Direct participation in the process of determining basic price levels may thus be limited to a small fraction of those actually buying and selling. The optimum number lies somewhere between Taussig's emphasis on the desirability of achieving an equilibrium rapidly by confining dealings over price to persons who are shrewd and well-informed (34, p. 149), and Macklin's claim that the judgments of many are safer and less speculative than the judgments of only a few (23, p. 331).

Both imperfect market knowledge and the costs of performing pricing services lead toward few participants in establishing basic price levels.

The degree of knowledge about factors and forces relating to price determination is variable from industry to industry, but it is frequently not great in total nor very evenly distributed among participating firms or their members. Attempts to improve knowledge include the market intelligence systems of private firms, and private and public statistical, research, and market news services. But these may still leave room for the exercise of much subjective judgment.

Even in industries which are highly concentrated, where entry is severely limited and products highly differentiated, the promulgator of announced prices may have to do considerable guessing about the relative demands for his competitors. His predetermined output can still, in practice, be too large or too small. This leads to attempts to control market conditions. Galbraith emphasized that industrial planning requires more control over prices since modern technology reduces the reliability of the market. Thus, to minimize the risk of loss and damage to the technostructure, and to maximize firm growth, both production planning and management of demand to assure a market are practiced (15, p. 189-219).

Uncertainties about demand are likely to be greater in those industries which are less concentrated, where entry is relatively unlimited, and products are generally undifferentiated. In addition, there are more uncertainties about the forthcoming supply, since output is not controlled by a few, but results from largely independent decisions by many. Various measures are often used to seek some degree of stability in prices or volumes. In agriculture, approaches used include Government support price and purchase programs, cooperative development, marketing orders and agreements, and voluntary regulation of volume. Support is also likely

for policies directed toward full employment and high-level overall economic activity, and for publicly sponsored market news programs.

Price determination is a service to an industry and involves costs. Irwin, in calling wholesale pricing a service performed by collective action of handlers who evaluate available information using statistical analysis, intuition, and training, indicates that cost appears as part of the gross profits of handlers (20). There are other private and public costs which might also be enumerated. Shepherd described the evolution of the price-making process in agriculture as one of both reducing the time and energy spent or wasted in price determination and of increasing the accuracy of the prices (32, p. 53-55). Thus, minimization of the industry and public resources required may support delegation of basic price level determination into few hands.

Many pricing systems for raw or agricultural products are effective only within certain limits. Such systems may cease to apply when the product is processed into a substantially different form or when the original product is combined with other ingredients. For example, many animal products or crops lose their original identity before they reach the ultimate user and prices determined on the raw or farm form have little or no significant effect on final product prices. The extent of linkage or interrelationships between pricing methods on the raw or unprocessed form and the processed or manufactured products varies from one industry to another.

Some pricing systems produce values which are effective only in the current period. Others produce values which apply in future time periods of varying length. Where exchange trading, terminal market pricing, or decentralized negotiations are involved, the current period is often only a day or so in length. Future values may be intended for a week, month, crop year, or manufacturing year, and tend to hold unless unanticipated events force a change. In general, prices in less competitive industries tend to be futuristic and those in more highly competitive industries current. But there are enough exceptions so that this feature tends to be an individual characteristic of pricing systems.

Evaluating Performance of Pricing Systems

Pricing systems can be evaluated at least subjectively. Subjective evaluation certainly leaves much room for argument. But, given the current knowledge of structure, conduct, and performance, quantification is difficult and can only be approached through detailed analysis. Terms such as the following can be employed in subjective evaluation: fair, equitable, just, or reasonable; efficient or least cost; realistic, workable, representative, or operable; sensitive or flexible; and, stable or orderly. Many of these points are interrelated and often in partial conflict. Hence, a composite score for performance may not include the highest values for individual points, but rather represent a compromise among various criteria.

Today terms such as "fair" and "equitable" are in common use. Pricing has long been surrounded by such ethical connotations, whether expressed as customs, moral standards, edicts, or laws. "Just price" traces to early economic thought. In today's economy, legislative authority, executive persuasion, and regulatory practice focus on preventing monopolistic and oligopolistic abuses, price discrimination, inflationary increases, unfair practices, and maldistribution of income.

Even where conditions of atomistic competition are approached, pricing systems are not above criticism. For example, Galbraith's theory of countervailing power (14) and the more recent resurgence of interest in farmers' bargaining power suggest that imperfections in pricing exist from the standpoint of equity and other similar terms.

The efficiency of pricing systems can be viewed in several dimensions.

Hague has recently defined an efficient pricing system in a classical sense. Factors include producing the right amounts of the right goods, optimum cost levels, correct resource allocation, rapid distribution, and guidance for both the short and the long run (16, p. 3-15).

Stigler's discussion of the primary requirements for an efficient market suggests a less rigorous role for price. Full knowledge, by itself sufficient for an efficient market, is not

realistically attainable in the absence of standardization of goods and localization of transactions. In bringing buyers and sellers together to exchange goods and money, a market is efficient if purchases can be made at the lowest price offered by any supplier and sales can be made at the highest price any buyer is paying (33, p. 55-56).

Thus, under competitive conditions (which are imperfect in varying degrees), efficiency may be acceptable if the pricing system produces values within some reasonable range. Within this range, various factors, such as bargaining power and knowledge, influence the exact level determined.

Efficiency may also be related to the cost and time dimensions of pricing. As previously noted, the determination of prices involves an economic cost, and costs are both direct and indirect. Thus, from the standpoint of technical efficiency, it may appear desirable for a limited number of participants to develop a high degree of expertise and determine basic values which are then widely used by others in the industry. But specialization of this function should not be carried to the extent that it widens the opportunities for individual gain through price manipulation.

At a particular point in time, there may be several pricing mechanisms which could be workable for a particular commodity or industry. A pricing system which is currently operable or technically feasible neither implies nor requires perfect knowledge on the part of all active participants. If knowledge is imperfect there may not be a perfect set of short-run equilibrium prices, but there may be alternative sets of possible values which could "clear the market" in linked time periods. The operative pricing system may do the best it can with incomplete knowledge and subjective judgment, limited participation in price determination, and the time available to arrive at some basis of trading in order to get on with the job of physically moving the product to retailers, consumers, institutional users, exporters, etc. The end result can be prices which are usable, but improvable.

Another problem arises in regard to how representative a pricing system may be of industry structure and practices.

Shepherd has suggested that pricing methods in agriculture progress from bargaining on each transaction to centralized markets, then to decentralized markets, and finally to a price committee system (32, p. 53-55).

Some evidence exists that progression of method does occur, even though each industry may not need to pass through each one of these exact stages. Some evolution within methods has also occurred. For example, negotiation may evolve from barter on each transaction to infrequent negotiation between a few participants representing large quantities. Progression in systems may also have occurred where industries have moved from more toward less competitive structures.

But even though pricing systems and methods are modified with the passage of time, pricing systems are resistant to very rapid change. Members of a particular industry become trained in and accustomed to a particular mode of operation, and key institutions become well-established. When structural and competitive changes occur very rapidly in a particular industry, it is quite likely that the pricing system will change far less rapidly. Thus, pricing systems need periodic reevaluation since relative performance can decline significantly in a few years. Hence, in a dynamic dimension, substantial cumulative changes in an industry cause problems with a pricing system and require drastic changes or even the development of an entirely new approach.

To what extent do prices actually need to be sensitive or flexible in order to reflect changes in supply and demand? Are there possible benefits which might accrue if prices were more stable or pricing more "orderly"? Most discussions note that prices of some commodities are more variable than those for other commodities. The distinction has often been drawn between prices of agricultural and certain other basic commodities and all other prices.

Mason, discussing an upswing in prices in the 1950's, indicated that grains, poultry and dairy products, textile fabrics, lumber, and other items produced in competitive markets led the upswing. With more stability in industrial prices, the dynamic elements in the price system were mainly wages and the prices of goods produced in the small enterprise sector of the economy (26, p. 170-172).

In a general article on agriculture, Knight, in the volume edited by Adams, suggested commercialization in farming may have produced

accelerated price effects in the same directions as the general price levels. He also discussed the volatile nature of agricultural prices in the short run. Here, on "free markets," prices change frequently and in small increments, sometimes within each day. Small changes in supply and demand and ". . . a host of dynamic facts and fancies daily assert their influence without moderation. . ." (1, p. 10-14).

During the past two decades, positive Government actions of various kinds to help stabilize the economy have been increasing in number and frequency. Heller suggested that developing public policies resulted in the virtual disappearance of the countercyclical syndrome of the 1950's and that some progress had been made by the mid-1960's in approaching the four objectives of full employment, high growth, price stability, and balance-of-payments equilibrium (19, preface, p. 59-60, 116).

Over time, more long-run price stability has been achieved for some agricultural commodities. Likewise, various programs and the use of particular pricing mechanisms have resulted in more short-run price stability for some agricultural commodities. But for others, short-run price instability is still evident.

Taussig many years ago discounted the precision of short-run equilibrium prices and suggested price variability might even impede product flow. He said that even on a single day there is no one price rigidly settled by the equilibrium of supply and demand. With ". . . the wavering doings of human beings. . ." and uncertainties about supply and the conditions of consumption and demand, differences of opinion are likely and prices are not mathematical certainties, but statements of tendencies. Fluctuations are likely, but with speculation, knowledge, and large-scale dealings, the seasonal price will be more quickly and smoothly determined and maintained between narrow limits. For the ultimate consumer, the early and exact adjustment of price brings more even utilization of the available supply (34, p. 148-149, 159-160).

We can have short-run price fluctuations arising from several causes: (1) accurate response to changes in supply and demand, (2) overreactions due to incomplete knowledge or the nature of participation in price making, and (3) incompatibility of the pricing mechanism with the current nature of the industry. Therefore in judging the need for price flexibility, we should identify the causes of variations in prices emanating from the present system. Automatically attaching precision to today's values in clearing the market, as determined by today's pricing system, will preclude any consideration of other sets of values or alternative pricing systems. It would also eliminate any benefits from more stable prices such as more orderly movement of the product, from improved equity considerations, or from greater confidence in the reliability of the pricing system.

Pricing Systems in Agriculture and Research Problems

Pricing systems for agricultural products are diverse. They range across the continuum from free market to authoritarian types. Table 2 illustrates this diversity for several commodities, as indicated by selected publications (17, 24, 27, 31, 35). Just as pricing systems are diverse, so, too, are the types and scopes of problems which can merit research attention.

In agriculture, for example, the growth of integration has had impacts on pricing. Farris (10, p. 2) indicated that ". . . an adverse side effect of integration may be to impede pricing efficiency by reducing the fraction of total supply of a commodity which enters into market price formation."

Breimyer (4, p. 97-105) suggested vertical integration tends to substitute internal administrative controls at some stages of production and marketing for the price system. For example, linking stages by integration may result in ownership of farming resources by the marketing firm or contract production, where producer returns are determined by negotiation, formula prices, or piece-rate payments. He also suggested some adverse effects from imperfect central market pricing mechanisms because of the decline in central wholesale markets, the rise in direct selling, and the growing practice of trading on someone else's price. First, as actual negotiation becomes small, it can become unrepresentative and invite manipulation. Second, when only small quantities of uncommitted supplies are traded, a given price level can prevail too long, then overadjust when changes take place, giving rise to erratic price movements. Examples cited of the use of a published

Table 2.--Summary of pricing systems for selected agricultural products

Commodity	General type of pricing system	Basic price level determination	Methods of determining other prices
Eggs	Free market.	Daily base price quotations in a few wholesale markets. In New York & Chicago supported by cash exchange trading.	Premiums, discounts to other trading levels, grades & sizes, quantities, & geographical locations. Some producer returns under contracts not related to short-run price changes.
Broilers	Free market.	Prices paid by large retailers for ready-to-cook broilers, selected cities, for future deliveries.	Premiums, discounts to other trading levels, quantities, & geographical locations. Periodic specialing at retail. Most producer returns under contracts related to performance standards.
Fluid milk	Authoritarian to determine minimum levels.	Formula or negotiation under Federal-State orders, generally a pooled price to producers based on classified pricing for various end uses.	Some negotiation on differentials but many wholesale and retail prices specified under orders.
Butter	Free market with Government price supports providing a floor.	Quotations based on cash exchange trading at Chicago & New York by primary receivers & central market wholesalers.	Averaged differentials for location & grade at country plants & also to cover margins for services in selling to wholesalers & retailers.
Natural cheese	Free market with Government price supports providing a floor.	Prices established on Wisconsin Cheese Exchange in Friday trading by plants & processors the primary indicator.	Assembly point prices tend to follow the exchange. Processed cheese prices become administered type.
Live meat animals	Free market.	Decentralized negotiations at auctions, country plants, or terminal market values.	Reflections to and from dressed meat prices.
Dressed meat	Free market.	Daily commercial quotation at Chicago.	Formula pricing to buyers, quoted price lists, or negotiations. Variable price merchandising at retail with periodic specialing of cuts.

-- Continued

Table 2.--Summary of pricing systems for selected agricultural products--Continued

Commodity	General type of pricing system	Basic price level determination	Methods of determining other prices
Further processed poultry products	Administered.	Manufacturer's list prices, with adjustments for volume, delivery, branded vs. unbranded.	Retail markups. Negotiated or market price to slaughtering plants for poultry.
Cotton	Free market with Government price supports providing a floor.	Series of central market committees, under specific legislative authority, issue price quotations at central market level.	Application of differentials for location, grade, etc. Becomes manufactured products in use and original identity largely lost in pricing consumer items.
Tobacco	Free market.	Warehouse acutions held for several weeks or months after harvest and curing where producer's tobacco is sold to tobacco companies.	Becomes manufactured products in use & original identity largely lost in pricing consumer items.
Sugar	Authoritarian with minimum prices & quotas determined under Sugar Act.	Sugar Act minimum prices for raw sugar at processor level.	Plus distributor & retail margins over refined sugar prices which are under basing point system. Beet and cane growers paid contract price largely reflected from raw sugar price. Sugar for food processors loses identity in marketing.
Many fresh fruits and vegetables	Free market.	Auction, shipping point, or terminal market sales to receivers or retailers.	Differentials from shipping point price or pool price to grower, from terminal market values to shipping firms. Distributor & retail margins likely to vary seasonally, etc.
Many vegetables for canning or freezing	Free market.	Mainly contract prices between producer & packer determined in advance of planting or harvest. These have fairly close relationship to selling prices of packers.	Contract prices may be affected before & during harvest seasons by fresh market prices. Canned & frozen food prices are administered and/or determined by broker or direct sales to distributors, institutions, and retailers.
Wheat	Free market with Government price supports providing a floor.	Terminal market price quotations supported by cash & futures trading by country elevators & terminal market firms.	Application of differentials for geographical location, trading level, etc. Becomes manufactured products in use with identity largely lost in pricing consumer items but somewhat reflected in animal feeds.

price quotation with premiums and discounts were the National Provisioner Yellow Sheet for Livestock (meat) and the Urner-Barry egg price. He contended central market trading is not essential to a good pricing system. Remedies suggested for agricultural pricing problems included making improvements in traditional market pricing, continued use of price supports as protective floor prices, bargaining associations, committee pricing, classified order pricing, and limitations on integration.

Integration illustrates a possible separation of the basis for producer return from current market price levels, giving rise to possible equity problems of considerable magnitude. Eggs and meat are examples of growing incompatibility of central market pricing mechanisms with current structures and practices.

Volumes traded on butter exchanges are even smaller today than in the early 1950's, and only a few large firms participate in exchange trading (27(c), p. 284-285). Due to the lack of any other system for comparison, the question of whether spot market trade prices afford the best estimate of prices which move all butter through market channels is difficult to answer (17, p. 24). Terminal market prices on wheat become less representative as more wheat shifts from terminal to subterminal markets. If this trend continues, it would become appropriate to reevaluate the usefulness of the present terminal price-quoting system (35, p. 223). The examples on butter and wheat suggest a need to study modifications in the present system or alternative systems.

Under provisions of specific legislation, the Secretary of Agriculture has labeled 15 central markets as "designated spot cotton markets." The designated markets were reviewed in 1951-52 and again in 1959-60 for their suitability as major sources of price information (35, p. 119). Continued reexamination of pricing systems at periodic intervals may be warranted to keep them updated.

On fruits and vegetables, price-making takes different forms in different institutional environments. Each of the major types of environments has different characteristics and yields somewhat different results. For example, the timing of price changes is different, and the pricing system in some markets makes them more sensitive than some others to small changes in supply and demand factors (24, p. 93-95). This suggests that in-depth studies may be required to find an optimum solution for each commodity.

On eggs, problems with the long-entrenched pricing system reached the point where Congress authorized a large-scale program of research to help find solutions. A recent report (31) analyzed the present pricing systems, possible improvements, and alternative systems and methods. Based on this report and related studies, a committee representing all segments of the egg industry was formed to develop a plan for improving the egg pricing system. Although this is the most recent example of a comprehensive study, pricing systems in other commodity areas could eventually merit similar attention.

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Estimating the Productivity of Irrigation Water

By Howard C. Hogg, Lloyd B. Rankine, and Jack R. Davidson

An attempt to incorporate known agronomic relationships in a production function estimated from field records is illustrated in this paper. The example considered is sugarcane irrigation on two Hawaii sugar plantations.

Deriving a meaningful functional relationship from records devised for management control depends upon the researcher's awareness of relevant agronomic concepts and the content of the records kept. Agronomic concepts are reflected by the results of physical experiments concentrating on one or more aspects of plant growth. Not all of these results agree nor do the scientists always agree on interpretation. Basic theories of how the biological and chemical agents interact in agricultural production are being constantly reworked as the sciences mature and the technology of measurement advances.

Field records provide insufficient detail to adequately measure all the separate effects considered relevant. Also, record systems tend to lag considerably behind changes in the state of the arts. Nevertheless, with increasing demands on available water supplies, the economist is frequently called upon to estimate the economic productivity of irrigation water. Time and budget considerations typically preclude the use of comprehensive experiments as the basis for these estimates.

Soil-Moisture-Plant Relationship for Sugarcane

Some of the agronomic principles associated with water and plant growth are as follows: A particular soil will hold a given amount of water against gravity when allowed to drain freely. This quantity is referred to as the moisture storage capacity of the soil, or simply as "field capacity." As this moisture evaporates or is transpired by the plant, the remaining moisture is held with increasing force or tension. When stored soil moisture is at a maximum (field capacity), moisture stress is perhaps 0.33 atmosphere (ATM) and when all of the moisture available to the plant is exhausted, it is about 15 ATM. A moisture stress, C, is defined as the point where plant growth is retarded. In addition to these factors, the amount of water required in transpiration changes over the crop cycle.

A simple variable incorporating several of these concepts has been proposed for estimating water-yield relationships for sugarcane (2).[1] A slightly modified version of this variable, which can be computed from plantation records and meteorological data, is defined by the equation:

$$(1) \qquad W = \frac{E_a}{E_p} = \frac{(NxCS) + R_e}{E_p}$$

where:

E_a = actual evapotranspiration

E_p = potential evapotranspiration estimated for each climatic zone from pan evaporation observations

N = number of irrigation rounds applied to the field

C = the percentage of available soil moisture that can be used prior to reaching the critical moisture stress for a particular soil

[1] Underscored numbers in parentheses indicate items in the References, p. 17.

S = available soil moisture storage associated with the soil type found in each field

R_e = effective rainfall which we defined as 75 percent of the actual rainfall for the climatic zone in which the field is located.

The variable W then is a ratio of water adequacy which states that maximum yield can be maintained by irrigating when the percentage of available soil moisture represented by C has been exhausted. A shorter irrigation interval would not increase yield and a longer interval would decrease yield. The variable W represents a single estimate of water adequacy for the entire crop. The yield-maximizing quantity of water is represented by E_p which is the sum of plant moisture requirements throughout the crop cycle, water not limiting. Current agronomic thought suggests a need to allow for differential effects on growth if water deficits occur during different stages of the crop cycle (2). This would require estimating a W for each stage of growth, then treating these as separate independent variables.

Figure 1 shows the hypothesized relationship between yield and W. In this example C is 60 percent and the moisture stress at this point is 1 ATM. There is theoretically a point (to the right of point Q in figure 1) where additional water will result in decreased cane yield. In this paper, we are interested in determining the position and shape of the rising portion of the function (point O to P).

An Empirical Example

The fields of a single sugar plantation on the island of Oahu were divided into four groups. These groups consist of those fields irrigated with brackish and those with nonbrackish water and containing one of two physically similar soil groupings which are referred to as soil A and soil B fields.[2] The relationship between water quantity and moisture stress for these fields is given in table 1.

Robinson (5) has published research results that support a critical moisture stress of 2 ATM

[2] Group A fields contain dark magnesium clays and related soils. Group B fields consist of low humic latosols and related soils.

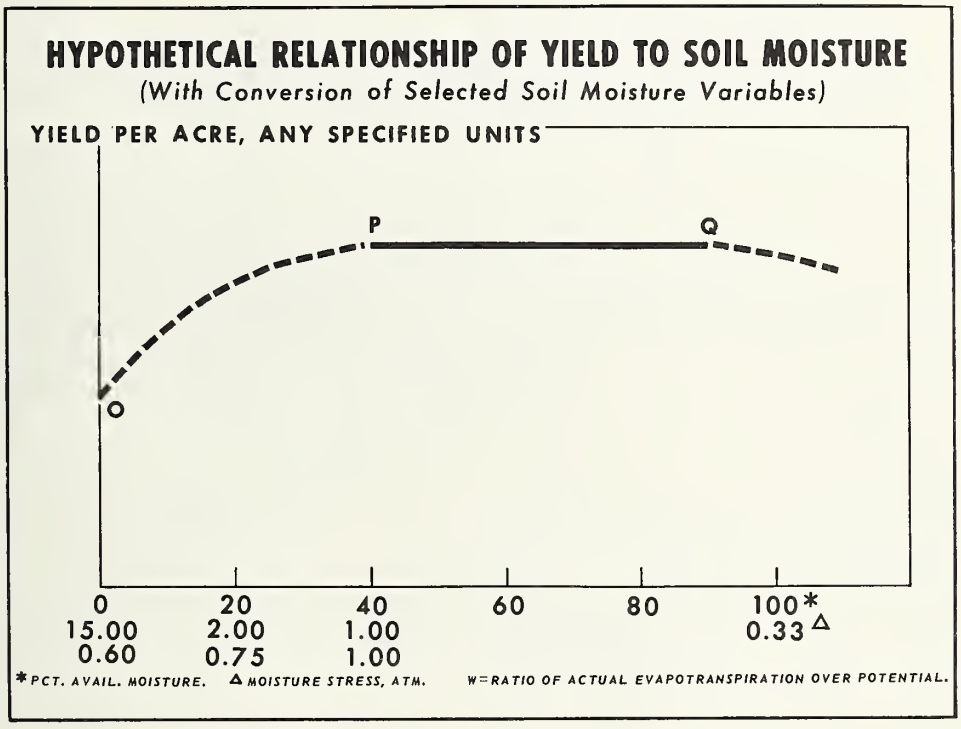

Figure 1

374-028 O - 70 - 2

Table 1.--Relationship between water quantity and moisture stress for A and B soils

A		B	
Soil moisture	Moisture stress	Soil moisture	Moisture stress
100	0.33	100	0.33
75	11	40	1
41	2	20	2
34	4	10	4
0	15	0	15

Sources: Data for soil A from (8), for soil B from (7).

for sugarcane. His findings are summarized in figure 2 where sugarcane stalk elongation is related to average moisture stress.

In addition to the C-factor, it was necessary to estimate potential evapotranspiration. This was done by first stating plant moisture requirements for different stages of growth, in terms of pan evaporation, then summing over the crop cycle. A detailed discussion of this procedure is provided elsewhere (1). The remaining components of W are available from plantation records.

Production functions for fields irrigated with nonbrackish and brackish water given in tables 2 and 3, respectively. Brackish water contains 3.24 or more grams of sodium chloride per gallon. The functions are stated for a given land productivity and all other variables (area of cane of harvest, planted or ratoon crop, N, P, and K) are held constant at their mean values to facilitate comparison. A reciprocal form is used because in most cases it provided the best statistical fit.

Equation (2) is given for comparative purposes. It is the result obtained from fitting a function to plantationwide data where the water variable is the reciprocal of total water (TW) applied rather than the reciprocal of W as in equations (3) through (8). The dependent variable in all cases in tons of cane per acre (TCA). The t-ratios for W in equations (3), (4), (5), and (8) all significant at the 1 percent level and are substantially larger than the t for TW in equation (2).

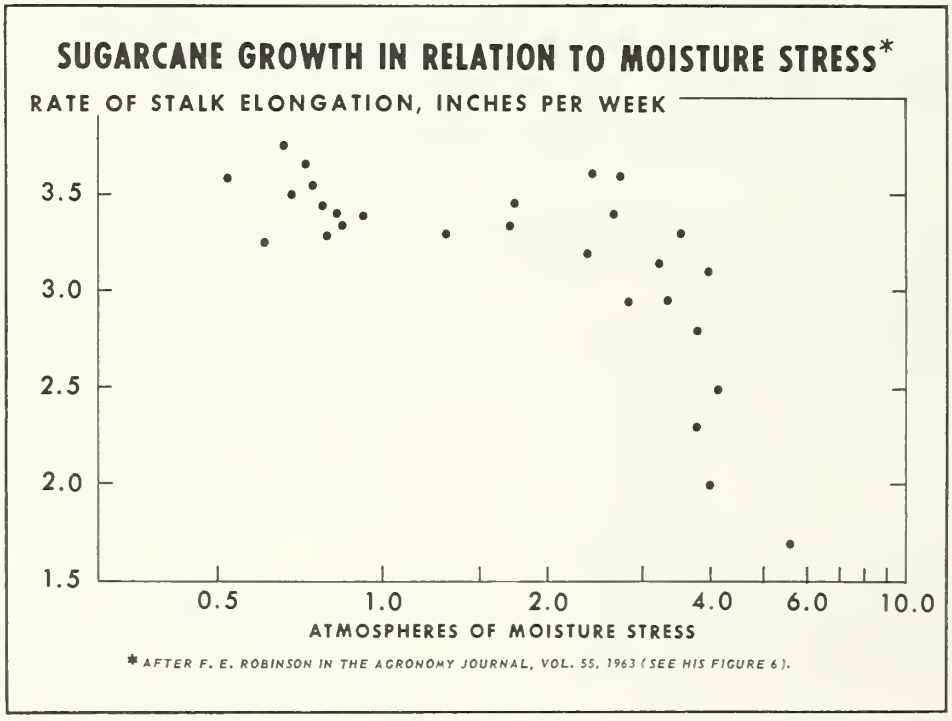

Figure 2

Table 2.--Production functions for fields irrigated with nonbrackish water [1]

Equation	Soil	C-factor	Growth-retarding moisture stress	Constant	Regression coefficient for 1/W
(3)	A	0.60	2 ATM	139.56	-18.31 (4.62)***
(4)	B	.60	1 ATM	167.10	-41.93 (5.44)***

[1] All other variables are held constant at their mean values.
*** t-ratio significant at the 1 percent level.

Table 3.--Production functions for fields irrigated with brackish water [1]

Equation	Soil	C-factor [2]	Constant	Regression coefficient for 1/W
(5)	A	0.25	134.07	-11.39 (4.89)***
(6)	A	.25	135.25	-10.31 (4.29)***
(7)	B	.30	127.53	-8.85 (2.32)**
(8)	B	.30	146.82	-12.54 (4.11)***

[1] All other variables are held constant at their mean values.
[2] The C-factors for these functions are largely arbitrary as the concentration of sodium chloride in the irrigation water is unknown.
** t-ratio significant at 5 percent level.
*** t-ratio significant at 1 percent level.

(2) $TCA = 123.54 - 1{,}164.18\,(1/TW)$
$(2.27)^{**}$

where:

TCA = tons of cane per acre
TW = total water in inches
** = t-ratio significant at 5 percent level.
(All other variables are held constant at their mean values.)

Although the C-factors for all moisture stresses occurring between 0.33 and 15 ATM were not tested, the functions given in table 2 appear to provide the best estimates for fields irrigated with nonbrackish water. These functions are superior to formulations employing different C-factors, as well as those fitted to plantationwide data (without distinguishing between soil types). The reason for the different growth-retarding moisture stresses between

equations (3) and (4) is not known. However, figure 2 indicates that the growth-retarding moisture stress is actually somewhere between 1 and 2 ATM. Considering the nature of our data the above result is not surprising.

The only difference between equations (5) and (7) of table 3 and equations (3) and (4) of table 2 are the C-factors. In the former case, to maintain maximum yield, it was necessary to irrigate when only 25 and 30 percent of the available soil moisture had been exhausted, respectively. For equations (3) and (4), irrigation was not required for maximum yield until 60 percent of the available moisture was used. In effect this means that the critical moisture stress is reached earlier when irrigating with brackish water. This findng agrees with agronomic theory.

Many physical scientists believe that yields can be increased by overirrigating to leach accumulated salts when the irrigation water is brackish. To test for this possibility E_p, which in this example is 1.52 x annual pan evaporation, was increased 12.5 percent. This modification requires a 12.5 percent overirrigation to maintain yields at the maximum level. Equations (6) and (8) give the results of this change. For A soils the result is insignificant. However, for B soils a substantial improvement is indicated.

The record system maintained by the Oahu plantation in the above examples did not permit the estimation of multiple-stage production functions. A second plantation, on the island of Hawaii, was used for this purpose. Unfortunately, only a limited number of observations are available; consequently, a detailed analysis was impossible. Equation (9) represents an example of a two-stage production function fitted to these data (3).

$$(9) \qquad TCA = -.84 + \underset{(1.51)}{67.08}\ W_1 - \underset{(1.32)}{43.75}\ W_1^2 + \underset{(1.33)}{120.78}\ W - \underset{(1.30)}{59.42}\ W_2^2$$

where $W_i = E_a/E_p$ in ith period.

For this function, C equals 1.00 and 0.60 in stages 1 and 2, respectively. If the components of W_i are correctly specified, yield should be maximized at $W_i = 1.00$. The yield maximizing W_i's for equation (9) are 0.77 for stage 1 and 1.01 for stage 2. This may result from assuming C = 1.00 for stage 1 or from an error in the estimation of E_p for stage 1. While the procedure illustrated by equation (9) is not directly comparable to the functions presented earlier, it is sufficiently interesting to warrant consideration in work of this type.

Conclusions

These results suggest that when production functions are estimated from field records, a serious effort to incorporate known agronomic principles can lead to improved estimates. Analyses of this type provide management data in the form of a production function which can be optimized in a conventional manner. Reference (3) discusses the optimization of a function employing a similar version of the composite variable discussed in the present paper. In this discussion, the production function is used to estimate optimum irrigation level as a function of water cost, a static factor demand relationship for irrigation water, short-run cost curves, and product supply curves. In addition to providing management data directly, these analyses can serve as a basis for the refocusing of field records. That the plantation records could not support all the refinements suggested by recent developments in the agronomy of sugarcane culture is to be expected. The records were not designed for such analysis. However, relatively simple adjustments could greatly increase their analytical value. In the present case, knowing the date of each irrigation round for each crop would allow testing for the differential effects on yield of water deficits occurring during different stages of growth. Similarly, it would be helpful to know how consistently a particular level of irrigation is maintained for each field. A measure of moisture stress just prior to each irrigation round would be most helpful in this respect. Even a subjective judgment of high, low, or average by the irrigation superintendent would be better than no information at all.

This work also emphasizes the need for more comprehensive experiments to develop adequate water-yield relationships. Although the piecemeal approach can provide much useful data, serious attempts should be made to close the gaps.

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Characteristics of Supply and Demand in Outdoor Recreation[1]

By Hugh A. Johnson

Growing interest in rural development as a national policy and continued emphasis on the potential of outdoor recreation as a catalyst in a rural renaissance justify reflection about what constitutes outdoor recreation and the demand-supply relationships involved.

Theoretically, one can construct supply-demand curves for outdoor recreation products almost as he would for corn, beefsteaks, or automobiles--with a unique caveat that, for outdoor recreation, users generally must travel to the product rather than have the product transported to them. Land, water, wild life, and scenery must be utilized where and in whatever condition they are found by the user.

A few characteristics assume major significance in recreation developments. They are discussed in this paper both in general and as they affect individual choices for outdoor recreation activities.

Demand for Outdoor Recreation

Most "demand" studies in outdoor recreation actually are user studies. As such, they measure demand through actual participation only. They reflect use of available recreation opportunities under existing circumstances. Dangers of projections based on the status quo have been amply demonstrated, for example, by the skyrocketing growth in water-based recreation following development of artificial lakes where none had existed.

However, since common usage prevails, this paper will refer to use, or practice, as "demand."

Demand for outdoor recreation has many facets. These encompass a wide range of activities. Each has unique demand limitations and unique spatial requirements.

The bulk of the American public has relatively simple preferences for outdoor recreation. Ten categories cover 90 percent of the preferences. These are: automobile riding for sightseeing and relaxation, picknicking, swimming or going to the beach, fishing, boating and canoeing, hiking, nature and bird walks, hunting, camping, and horseback riding.[2]

Some of these categories are based on use of public highways. There is little opportunity for private development of the basic resource. However, opportunities exist for providing related services. Eating places, refreshment stands, and gas stations are examples. Overnight accommodations and specialized attractions often can be developed with an eye on the seasonal demands by pleasure-driving recreationists.

Units of time available affect the distance people can travel. Thus, busy mothers with small children need parks and playgrounds near home. Older children need swimming pools, tennis courts, and other play areas within walking or bicycling distance. Workers on an 8-hour day need golf courses--and to some extent shooting preserves--within relatively short commuting distance.

People on an afternoon or a single-day outing usually travel short distances. Their activities are circumscribed by travel time zones of approximately 1 hour or less, one way. This usually means about a 25-mile radius from home in most urban situations, unless one has quick access to high-speed highways.

As distance from home to potential recreation site increases, day uses drop off rapidly. By about 2 hours of driving time or roughly 75

[1] This article is a modified version of a paper prepared for presentation during Arkansas Extension Recreation Training Workshop, July 1969.

[2] Outdoor Recreation Resources Review Commission. Outdoor recreation for America. Govt. Print. Off., 1962, p. 35.

miles, the character of demand shifts toward overnight use but with day use still dominant.[3] Beyond these rough limits the recreation tends to be of kinds people expect to do on weekends, holidays, and longer trips. The number of visitors that can be expected from a population center declines rapidly as the distance increases.

Numerous recreation user surveys agree that recreationists more than 100 miles from home tend to have larger than average incomes. They usually have expensive equipment, demand quality facilities and services--and more and more frequently are willing to pay user fees for access to quality facilities.

Still other aspects of demand result from variations in age, sex, income levels, family composition, and other socioeconomic factors. As examples: teenage boys want a chance to show off before teenage girls and teenage girls want places where there are teenage boys; couples with young children want safety and interesting variety for the children as well as something of interest to the father. Mothers in this age-group usually require only safe play areas for the children and comfort for themselves.

Older people tend toward less physically active forms of recreation. They are more apt to drive for pleasure, relax at the beach, picnic, fish, take nature walks, and so forth. Although they utilize many of the same facilities as all the other groups, they reflect a different segment of market demand.

Demand for recreation is highly seasonal. Most family vacations occur during the out-of-school summer months and when the weather is comfortable. Although snow and ice sports are increasing in volume, their proportionate share of total recreation probably is not.

The main summer recreation season is being extended, however, through such media as fall color tours, winterized second homes for weekend occupancy, and publicity about facilities for winter activities. More and more people not tied down by school schedules are taking advantage of both reduced rates and smaller crowds during off-season when they schedule vacations.

Demand also is affected by the kind and quality of recreation resources available. Most people want recreation near water. They prefer rolling, wooded background to flat, open areas. Significant numbers prefer "name" places or popular spots. Others prefer isolation, quiet, and natural settings. Few are satisfied by a single-purpose facility. Most prefer--and need--combinations of natural resources, facilities, and services.

More and more people are trying new kinds of recreation. The growth of snow-mobiling in the last 5 years is an example of a new recreation activity which has become epidemic in some communities. Camper-trailers, motorboats, beach buggies, and a host of other equipment have been developed within the past few years to meet the ever-expanding variety of recreation demands.

Our expanding recreation market is almost certain to offer more new experiences and more new products in the years immediately ahead. Some of these will have tremendous implications for new business in local areas.

Each of these factors, or variable conditions, affects the factor mix one uses as he analyzes the demand-supply situation for different kinds of recreation. They are key considerations for the ultimate decision whether to develop a single, specialized kind of facility, a complex of enterprises--or forget the whole idea of going into recreation at all.

Supply of Outdoor Recreation

Resources must be available in desired locations and combinations before they are useful for outdoor recreation. Someone usually must provide access, develop facilities, and provide services. Even nature walks normally require access over public or private property. And the relatively simple recreation of pleasure driving involves combinations of right of way (resources); roadway and surfacing (facilities); and police patrols, gas stations, restaurants, and rest stops (services).

[3] A recent study of St. Louis residents showed that people generally were willing to travel 100 miles round trip for 1 day of recreation, 200 miles for the weekend, and 250 to 500 miles for 3 to 5 days of activity. Nearly two-thirds of all trips to water-oriented outdoor recreation were less than 100 miles. Source: Glenn A. Gillespie. An evaluation of the factors affecting the demand for water-oriented outdoor recreation. Unpub. Ph. D. thesis, Univ. Mo., 1966, 136 p.

Large areas available for extensive use are required for hunting, trail rides, wilderness experiences, and related activities. These areas commonly are in public ownership. Exceptions are found in large private holdings of timber and power companies, some mineral operations, and large ranches. Recreation in these situations usually is a minor use of resources which conflicts little with the major purpose of ownership. Recreation often complements the major uses. Timber companies, for example, often invite recreation use of their holdings (under certain restrictions) as a matter of public relations. Minimum facilities also frequently are made available for recreation use.

Management and imagination should be combined with natural environments to meet user demands for recreation. Naturally desirable areas can be made undesirable for recreation by poor management. Other areas originally marginal for recreation can be made highly successful through foresight and management. Common examples of successful changes in use might include marginal farms converted to prime golf courses, eroded waterways converted to farm ponds, or small flood control works where the pool is managed for recreation.

The effect of distance is reflected in characteristics of demand for a specific recreation site. One must decide whether to concentrate on day use, weekend, vacation, or though-traffic recreation needs. These affect the kinds of related services one puts together in the recreation package being offered.

Private Enterprise in Development Areas

The Outdoor Recreation Resources Review Commission recommended a system of resource development area classification involving six classes of recreation areas. These are (1) high-density recreation, (2) general outdoor recreation, (3) natural environment, (4) unique natural areas, (5) primitive areas, and (6) historic and cultural sites. Degree of recreation use ranges from intensive to extensive, and from major emphasis on needs for activities to major dependence on natural qualities of the environment or on historic or cultural characteristics.

In high-density recreation areas, private enterprise can provide some of the capital, management, and labor for services and facilities--such as parking areas, marinas and other boating facilities, swimming pools and bathhouses, eating places, riding stables, and many others. It is often practical to collect fees for use of such facilities.

Sometimes optimum benefits would accrue to society when these facilities are both owned and operated by private enterprise. In other situations, some of the facilties should be publicly owned and maintained but operated privately under a lease or concession system. And, of course, there are numerous situations where the facilities must be owned and also operated by the public, either because the operation would be uneconomic for private operators or because experience shows that public health, safety, and other interests (including community policy) require public management.

Areas developed for less dense recreation uses also provide many opportunities for private enterprise. The special feature of these areas is their ability, through development of facilities, to sustain a large and varied amount of activity such as camping, picnicking, fishing, water sports, nature walks, and outdoor games. Many privately owned commercial recreation facilities could be located in these areas. They could both complement and compete with related public facilities.

Three of the ORRRC classes--natural environment areas and, to a lesser extent, unique natural areas and historic and cultural sites--provide some opportunities for private enterprise to meet service needs of the recreationists. Historic and cultural sites, caves, hot springs, and other attractions often are privately owned and operated as recreation attractions. Vacation farms, dude ranches, riding stables, fishing camps, motels, restaurants, guide and outfitting services, and a variety of other businesses can be operated near the significant attractions.

Primitive areas, like many unique natural areas, provide business opportunities primarily for guides, outfitters, dude ranches, and others providing services to people who want to get into the back country. Novices and the general public are barred from some of these areas unless they are accompanied by competent and adequately equipped guides. Such areas have

relatively few vistors, but the personal services required per visitor usually are many and expensive.

Location for Private Enterprise

A study recently completed of private developments in Appalachia demonstrated that small, scattered individual operations generally were uneconomic and unsatisfactory.[4] Studies in other regions bear out this finding.

Private operators frequently cluster around public attractions which, in effect, collect potential customers for them. About 90 percent of operators in an ERS study of private facilities were near public lands and water.[5] Nearly half of the operators were located near other privately owned recreation facilities. In developed recreation areas, the drawing power of one firm is enhanced by others. Their combined facilities attract more visitors than most of them could do individually.

A study of recreation subdivisions in the mountains west of Washington, D.C., clearly demonstrated the impetus provided for new subdividers when others also were operating in the same area.[6] The same principle applies everywhere in recreation development.

Competition and Complementarities Between Public and Private Facilities

Private operators frequently accuse public agencies and large corporations of "unfair competition." Such accusations have merit where high-quality conveniences are free or are available at rates which would not recapture the investment cost in a reasonable manner.

Free facilities and services, however, are often provided by public agencies because the private sector could not afford to provide them or it has not responded to a demonstrated demand. In addition, certain measures more efficiently provided by public agencies are required to protect the health of users. Other improvements are needed to help conserve the natural resources of areas used intensively by the public.

Many private campground operators owe their present success to location of public campgrounds nearby. Generally speaking, public campsites tend toward the rustic and provide minimum services consonant with requirements for health and demands for services. Private operators may be able to furnish additional facilities and services demanded by other visitors using the same recreation areas. Frequently, the public and private developments need not be competing for the same customers at all.

Riding stables, dude ranches, wilderness pack trips, and river boating operations depend on public access for their space. Hunting and fishing guides depend on public lands and waters for their livelihood. Motels, restaurants, gas stations, and other tourist services often locate at a central point for people who want to visit major attractions at publicly owned facilities.

Recreation on Farms and Ranches

The economic feasibility of recreation enterprises on farms and ranches depends on the demand for the resources available and the manager's abilities and interests. Analysis of opportunities must follow the same tortuous route through joint costs, opportunity costs, risk, seasonal labor utilization, and demand for the products as is done for any farm enterprise.

The size and intensity of recreation enterprises on farms or ranches depend upon whether one aims toward (1) commercial or major enterprise organization, (2) supplemental or complementary enterprises, or (3) capturing income from opportunities.

Commercial, or major, enterprises require the same high degree of management as any other farm operation. Successful operators frequently find that serving the recreation needs of the public is more satisfying and more profitable than alternative farming opportunities. Farm enterprises may then be operated in a supporting role.

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Supplemental, or complementary, enterprises such as vacation farms, fee fishing ponds, shooting preserves, or small campgrounds fit in around the major farm operations. Opportunity operations are those which charge for some recreation use of their resources, without major additional investment. Boarding horses, sale of hunting or fishing rights, and sometimes rustic camping are in this category.

Budgetary analyses by ERS and others have almost universally demonstrated the same direct relationships between size of recreation enterprise and net returns as for other farm enterprises. Major enterprises are usually managed better than minor ones and tend to be relatively more profitable.

Apparent low returns, however, may understate the actual net income from minor recreation enterprises. Operators frequently credit total taxes, total electric bills, total fire insurance, or building repairs against the recreation business and thus tend to understate the true net cash returns.

Several studies of net returns from rural recreation enterprises are summarized in table 1. Generally, these enterprises were smaller than commercial scale and often supplemented other enterprises or were supplemented by other income sources.

Reasons for inherently low returns involve the highly seasonal nature of the business; dependence on part-time, unskilled labor and management; poor location relative to demand; high overhead costs per productive operating unit; and inability to attract and hold adequate numbers of customers.

A nationally syndicated economic observer reported a few years ago that three out of five small businesses begun would fail financially, or go out of business for some other reason, within 5 years of the time they started. My experience and observations show that small recreation enterprises will demonstrate no better success. And probably not more than half of those that hang on for 5 years will be really financially successful.

Even the larger, complex, commercial recreation enterprises require exceptional management, with ability to manage a business providing an esthetic service to an ephemeral public. Relatively few rural people have the needed managerial abilities. As with every other kind of successful undertaking, one must provide the kind and quality of service wanted by the public in a highly competitive market.

Table 1.--Average net returns from recreation enterprises

Recreation enterprise	Arkansas (1962)[1]	Wisconsin (1965)[2]	Appalachia (1966)[3]
	Dollars	Dollars	Dollars
Private campground...	640	2,227	1,510
Hunting preserve.....	-4,000	[4] 2,814	[6] 330
Fishing area...	320	3,102	770
Riding stable..	1,100	3,803	[7] 2,490
Vacation farm..	--	[5] 865	620
Boating rentals	1,300	--	--
Guide services.	1,800	--	--

[1] Max F. Jordan. Opportunities for improving rural-family income through recreation enterprises. Ark. Agr. Expt. Sta. and U.S. Dept. Agr., Bul. 673, 1963.

[2] Data from Res. Rpts. 36, 43, 44, 46, and 47, Res. Div., Col. Agr. and Life Sci., Univ. Wis. Rudolph A. Christiansen and various authors.

[3] Hugh A. Johnson, Judith M. Huff, and J. J. Csorba. Private outdoor recreation enterprises in rural Appalachia. U.S. Dept. Agr., ERS-429, 1969.

[4] Pheasant farms, predominantly.

[5] Does not include two large full-time operations.

[6] Primarily lease of goose and duck blinds.

[7] Often restricted to boarding horses.

Opportunities exist in almost every community for developing recreation enterprises. Chances for financial success, however, are best in areas close to large population centers and to areas where water-based recreation can be developed.

Summary

Outdoor recreation is an economic good both produced and utilized at some cost in cash, effort, and use of resources.

Demand for outdoor recreation is strong and should remain dynamic during the foreseeable future. Part of this strength will be caused by population growth and higher levels of income.

Another part, however, will be created as present population becomes more accustomed to outdoor recreation as a use of leisure and looks for new kinds of recreation. Development of new facilities and services to meet presently unsatisfied demand and new kinds of equipment to create new demands also will contribute to overall growth.

Demand in local areas for particular kinds of recreation and for individual recreation enterprises will vary from the general picture. The combinations and quality of natural resources available, their location relative to population centers, the socioeconomic characteristics of users of recreation facilities in that area, the kinds and quality of facilities offered, and the costs of participation are major factors for consideration when assessing potential demand.

Private recreation enterprises generally have the best opportunities for success in or near densely populated areas where it is economically feasible to provide capital, management, and labor for services and facilities. The concentrated use and the specialized nature of these services make it economically practical to collect fees. Opportunities for private enterprise weaken as dependence on services and facilities decreases. Under these conditions, private enterprise still can provide specialized services which utilize public resources in a complementary relationship. Motels, gas stations, and restaurants complement highways. Guides and packers--with their horses, equipment and knowledge--complement Government ownership of land resources.

Opportunities for new recreation-serving enterprises should increase in response to the growing demand. Success, however, will depend on how well management gages the demand when developing its enterprises and how effective it is in managing the business.

Book Reviews

Strategies of American Water Management

By Gilbert F. White, University of Michigan Press, Ann Arbor. 155 pages. 1969. $5.95.

This work is an important contribution to the science of water management, particularly if considered in tandem with Alternatives in Water Management, issued in 1966 as Publication 1408 by the National Academy of Sciences and the National Research Council. Professor White chaired the committee which prepared the "Alternatives" report and this book on "Strategies" seems to be a personal extension of the NAS/NRC report. "Alternatives" elucidated a viewpoint that water resource and other natural resource development efforts involve multiple goals which can be competitive, complementary, or in some cases supplementary. Goals of water development, such as improved water quality, are intermediate ends and alternatives to such larger goals as an improved quality of life.

In "Strategies," White carries this line of reasoning a good deal farther and not only provides a framework for evaluating where we are in the science of water management, but also charts some intellectual directions for the future. From his discussion I gather that enlightened policies for the enhancement of our total environment as it involves water are more the products than the basis of a rational approach to conceiving multiobjective and multimeans plans. This is to say that the balancing of objectives and alternative means for their accomplishment will yield scientifically defensible, politically supportable, and concrete yet flexible policies. I regard policy as pertaining to a general course of action, but not to each individual action itself. This appears to be consistent with White's considering as strategies the alternative operational methodologies for responding to the water environment in order to meet specified aims. If so, strategy and policy are synonymous. The Nation's problem is to choose and implement the correct strategies. Success requires, hopefully in decreasing order, a careful analysis of the alternatives, some statemanship in catering to opposing views, and a degree of luck.

White goes on to describe and discuss six types of strategies that have historically dominated or now characterize American water planning. He defines each in terms of the nature of the development opportunity posed in different circumstances. These include: (1) Single-purpose construction by private managers, an example being farm water supply; (2) single-purpose construction by public managers, with navigation and project irrigation being examples; (3) multipurpose construction by public managers considering multiple means, the example being our current preoccupation with comprehensive planning rather than with a comprehensive strategy for planning; (4) single-purpose action by public agencies using multiple means, illustrated by flood control; (5) the broadened options provided by including research as an additional management tool, with vegetation/streamflow studies, saline water conversion, and weather modification the primary examples; and (6) a possible (but lacking, according to White) comprehensive strategy involving multiple purposes and multiple means, including research.

A particular advantage of this classification is its utility for gaining a quick understanding of historical and current water planning efforts in the United States. A weakness is the old question of whether the defined and illustrated types are mutually exclusive. For example, providing farm water supplies is increasingly a problem of choosing among alternative means, such as choosing private wells rather than rural domestic water systems drawing from ground water, natural streamflow, or reservoir storage.

The way White introduces "research" into our kit of planning tools is interesting. He discusses research into weather modification as a method of increasing the number of major options for a "grand design" approach to water development in selected areas. But he also tends

to equate research and development on weather modification and other major technological advances with research into such more mundane, but significant questions, such as water conservation, that can contribute toward scientifically rationalizing all six of his strategy types. Accordingly, I interpret his six types of strategies to be more cumulative than different, a belief which tends to be confirmed by the way his thinking and the book evolve.

Of special interest to agricultural resource economists is the role assigned to economics in his intellectual model. He regards economic optimization as an important factor in water management and planning decisions, although individual managers assign varying degrees of importance to that factor as well as to others (i.e., estimates of the water resource, recognition of available technology, and concern with spatial linkages). He feels that looking at economic optimization as only one of many factors involved in decision-making makes his model distinctive, especially when paired with the observation that all factors are profoundly influenced by social institutions. He, perhaps, is interpreting economics too narrowly. Modern economics as the science of analyzing the consequences of alternative decisions can indeed balance, or at least ordinally rank, variables other than quantitatively expressed benefits and costs, and need not disregard the side conditions posed by sociological and institutional constraints.

This book demonstrates the power of introspective and authoritative reasoning to clarify social alternatives. It is recommended as both a history and a futuristic analysis of water resource development and management in the United States.

George A. Pavelis

The Rise of American Cooperative Enterprise, 1620-1920

By Joseph G. Knapp. Interstate Printers and Publishers, Inc., Danville, Ill. 532 pages. 1969. $8.95.

Joseph Knapp, retired Administrator of the Farmer Cooperative Service and long-time civil servant, has shown his keen insight into the beginnings of cooperative endeavor in the United States. In a carefully documented narrative, he discusses in specific terms how farmers formed agricultural cooperative associations to find markets, reduce costs of farming, or protect themselves from "land sharks."

In the post-Civil War years, farmers' organizations--the Grangers and Alliances--fostered cooperative efforts. While few of the organizations survived, the movement exerted an influence on improving marketing and merchandising methods, lowering margins, curbing credit abuses, raising quality standards, and increasing economic and business knowledge. At the same time, specialized producers in areas of concentrated production were seeking to solve problems through cooperative enterprises. By the end of the century, many of these independent self-help associations were gaining strength. These included not only marketing associations but also groups interested in purchasing, irrigation, and insurance services.

The first two decades of the 20th centrury gave further impetus to the cooperative efforts and provided firm foundations for later operations. New rural forces, economic, technical, and social, each played a part, with the country life movement serving as a stimulant. The evolution of a Federal farm loan system under the Rural Credits Act of 1916 was another benchmark. Meanwhile, in the Department of Agriculture, the new marketing specialists were studying the field and rendering some assistance. State educational and marketing agencies also strengthened the movement; and farmers' organizations, especially the Farmers' Union, the Grange, and the emerging Farm Bureau Federation, played an active role. In this era of growth, federations of producers spread from local communities into large geographic areas, with marketing control as a feature at times.

Sometimes, cooperative purchasing was an associated development of cooperative marketing, with supply activities emerging from necessity--typified by the Cooperative Grange League Federation Exchange (G.L.F.), that in 1963 merged with the Eastern States Farmers' Exchange to form Agway, Inc.

Meanwhile, other forms of cooperative enterprise were increasing in strength. Farmers turned to cooperatives for crop and livestock improvement, for insurance, irrigation, and

telephone services. The cooperative store movement was characterized by vigorous experimentation in wholesale and retail operations in a rapidly changing business environment. Smaller businessmen found that they could meet many problems in their competition with mail-order houses, department stores, and chainstores through this approach. Other segments of the community employed cooperation "as a supplement or partner to other forms of business organizations, whenever it could perform services not otherwise available."

By 1920, Knapp found, farmers and other cooperators had learned many general, organizational, and operational lessons on "how cooperatives could serve them, on what cooperatives could and could not accomplish, and on how to form and operate cooperative associations."

"The Rise of American Cooperative Enterprise" is a valuable and unique contribution to the cooperative approach to economic activity. Knapp's brief introductions to the five major parts of the study provide birdseye views of the periods and unifying elements to chapters that otherwise are at times separate units. A number of the chapters have summaries that are a valuable device and a useful quick reference tool. The final chapter, with its 41 lessons farmers and others had learned from the cooperative movement by 1920 when about 27 percent of our people were gainfully employed in agriculture, is a fitting conclusion to this detailed interpretation of the early history of cooperation.

Vivian Wiser

Rural Sociology—Its Origins and Growth in the United States

By Lowry Nelson. University of Minnesota Press, Minneapolis. 221 pages. 1969. $6.75.

This volume can legitimately lay claim to being the most thorough yet succinct--and certainly readable--history of rural sociology as a social science discipline. In recent years--at annual meetings, in the Journal of Rural Sociology, and elsewhere--there has been much concern and discussion about the future of what Nelson considers an "indigenous discipline." This relatively small volume helps to put the discipline in proper perspective. In the reviewer's opinion, it goes far toward confirming the historical contribution, the current vitality and future prospects, and the inherently pragmatic and utilitarian quality of this particular social science. The book is certainly not an epitaph; nor is it an overly idealized account of the inception and development of this problem-oriented social science.

The volume includes 12 chapters that encompass a review of the "gestalt" out of which the discipline arose, an absorbing account of the developmental phase, and a consideration of current problems and perspectives. The narrative includes biographical references--most of which are brief--to the more prominent figures who have contributed substantially to the development of this field of social science. Of considerable interest is an appendix that contains "memoirs" of some of the distinguished and better known rural sociologists.

The chapter on perspectives and problems does a creditable job of assessing some of the strengths and weaknesses attributed to rural sociology. The same chapter identifies some of the challenges that face further development of the discipline. Its potential for further substantial contributions to the study of social change and the sociology of development--particularly as applied to the international sphere--is appropriately emphasized.

This work should certainly be of interest to all those concerned with the teaching of rural sociology. It should have considerable appeal, also, to the various "practitioners" in public and private enterprise for whom rural life--here and abroad--still is a major focus of concern.

Ward F. Porter

Agriculture in the Australian Economy

Edited by D. B. Williams. Sidney University Press, Australia. 336 pages. 1967. $8.50.

Australia's rising importance as a supplier of agricultural products for the growing markets of Asia has been responsible for increased interest in her agricultural capabilities and makes

this book about agriculture in the Australian economy particularly timely. The book, covering the most important aspects of Australian agriculture, consists of a series of reviews written by leading authorities in their fields. It was planned as a single project and was published to mark the first occasion when a conference of the International Association of Agricultural Economists was held in Australia, in August 1967. It is an excellent comprehensive source book covering all facets of Australian agriculture, but as the editor states, the reviews were not intended to be the type found in professional journals. A generous supply of maps, illustrations, figures, and tables is included.

As background, A. G. L. Shaw presents a resume of the history and development of agriculture, from the early settlers facing a difficult and strange environment to the present when technology has helped the Australian domesticate his environment, though many problems remain. B. R. Davidson finds that the importance of export markets in Australia's economy has led to a high degree of specialization in the economic structure of Australian farms, particularly those producing wheat and sheep. Intensive farming, though becoming more profitable, is limited by the high cost and scarcity of labor, high cost of fertilizers, and distances to markets. C. M. Donald, in a chapter on innovation in agriculture, describes Australia's main problems--infertility of soils and limitations of rainfall--and the methods used to cope with them, including use of fertilizers and legumes to build up soil, development and conservation of water resources, and development of plants and cereals suited to low rainfall.

P. C. Druce discusses the Commonwealth Government organizations concerned with administering agricultural policy and conducting research, also the areas where the States have prime responsibility--land settlement, production, and provision of services (including extension and education). G. D'A. Chislett analyzes the major national producer organizations, what they accomplish, and how they are slowly adapting to changing conditions. He also considers policy planning for the future.

D. H. McKay finds that the farm sector contributes a relatively small and declining proportion of the Gross Domestic Product and employs a small and declining proportion of the work force, though still providing the bulk of the export income. F. H. Gruen, L. E. Ward, and A. Powell, in evaluating changes in supply of agricultural products, find that the growth in total farm output has been rapid since the early 1950's, but the effects of the severe 1965/66 drought may be evident for some years, causing a slackening in rate of growth.

K. O. Campbell considers the changing emphasis in land policy. Earlier policy favored closer settlement (land redistribution), but with advances in agricultural technology, extensive agricultural systems have been found to be more conducive to economic growth in Australia. H. P. Schapper, considering rural labor, states that while production and land area of rural holdings have increased, the farm work force has declined. Important reasons are increased mechanization and growth of contracting services (e.g., aerial spraying, seeding, dusting, and top dressing).

A. W. Hooke finds that since the level of farm investment affects so many aspects of the economy, the Australian Government has adopted a variety of measures (budgetary, monetary, and price stabilization) to increase this level. F. G. Jarrett discusses the role of credit in Australian agriculture, considering changes in sources of farm credit and changes in credit policy as related to agriculture.

E. S. Hoffman describes the great increase since 1946 in number and scope of dryland and irrigation development projects. This has involved heavy public investment, and choices must be made between devoting resources to irrigation development and applying them to dryland technology. There has also been important development of transport facilities.

F. H. Gruen and G. C. McLaren discuss changes in food consumption and reasons for these changes. R. M. Parish describes the marketing of agricultural products and the functions of the marketing boards (nine Commonwealth commodity boards engage in or regulate export trade), concluding theat greater efforts are needed in marketing research.

J. N. Lewis discusses the economic background underlying agricultural price policy, the institutional problems in formulating programs, the objectives of the price programs, the emphasis on stabilization, and methods of price support programs and the levels of protection they

achieve. In the final chapter, S. F. Harris analyzes Australia's agricultural trade and trade policies, considering the main aims of the trade policies and the need for a new approach.

Geraldine W. Abbott

Population and Food Supply

Edited by Sir Joseph Hutchinson. Cambridge University Press, American Branch. 144 pages. 1969. $4.95.

Only recently has the dismal prediction of an unabating increase in world population jarred governments into taking serious steps to resolve the problem. This book consists of eight lectures given at the University of Cambridge, England, by scholars devoted to understanding the problem of food supply and fertility.

J. M. Thoday reasons that the retarding influence preventing developing countries from raising their standard of living is primarily the population explosion which thwarts investment. One should also be mindful that overcrowding leads to bellicose desires for new lands. As an interesting historical case in point, Thoday suggests that the major objective of the Crusades in the Middle Ages was to get land for Western Europe's increasing population rather than to reclaim land for religious motives.

A. S. Parkes lists the factors concerned with population growth, such as control of infectious diseases and substantial increase in food supply (there is little evidence that rises in population are due to increases in biological fertility). He takes the pessimistic view--at variance with Malthus' hopes--that families will not restrain themselves in the interest of population control.

It has been calculated that the agricultural potential for feeding the earth's population ranges from 47 billion people on American standards to 157 billion people on Asian standards. P. T. F. King contends therefore, that it is technically feasible to feed the growing world population, although it may take proportionately more and more of our resources simply to maintain the per capita level of food production; consequently, food prices may rise, Furthermore, larger and larger populations may not be economically unfavorable: It is cheaper to produce a large volume of goods than a small one, and large populations mean large markets.

Historically, great famines have preceded or followed violent social upheavals, wars and revolutions. Recognizing this fact, A. Leslie Banks warns that there is danger that punitive measures may be introduced by governments under pressure. There is always a temptation for coercive measures and behavioral regimentation to justify aims for survival.

Man's dietary needs and available food supply are discussed by R. J. Carpenter and B. H. Farmer. New developments in nutrition science and food technology may prove useful in providing cheaper food as traditional nourishment becomes scarce for poor people. This can be accomplished provided full advantage is taken of these developments through increased education.

William Allan states that population growth itself produces conditions which make the problems of agricultural development and food supply difficult. This is one of the main reasons why agriculture has so often failed to play the part it should in the transition from stagnant to expanding economies. A general rule is that national living standards are inversely proportional to the ratio of employment in agriculture to total employment. Poor countries have an estimated 80 percent of their labor force in agriculture, compared with 7 percent in the United States.

Despite the pessimistic population trend, there are hopeful signs. It is possible to increase the world's food supply substantially. Western countries have the technology to bring the rest of the world into a position of food surplus--though political skills will be needed to put the technology into practice. However, the basic fact will always remain that in the long run it will be necessary to stabilize human population as agricultural production cannot increase indefinitely.

The lectures do not leave one with the impression that all is dark for the future. The world's attitude toward birth control and the possibility of maintaining a balance between population and food supply are changing for the better. The intensive popularization of the problem is beginning to bring results.

Jack Ben-Rubin

U. S. GOVERNMENT PRINTING OFFICE - 1970 O - 374-028

Modern Breeds of Livestock

By Hilton M. Briggs with the assistance of Dinus M. Briggs. Macmillan Co., New York. 3d ed. 714 pages, illus. c. 1969. $12.95.

In his preface the author states that this third edition has been prepared with the express purpose of reviewing current developmental changes in our breeds of livestock. Some breeds have made notable progress and are growing in prominence while others have become less important.

Suggestions for Submitting Manuscripts for Agricultural Economics Research

Each contributor can expedite reviewing and printing his manuscript by doing these things:

1. SOURCE. Indicate in a memorandum how the material submitted is related to the economic research program of the U.S. Department of Agriculture and its cooperating agencies. State your own connection with the program.
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3. NUMBER OF COPIES. Submit one ribbon copy and two additional good copies of the manuscript for review.
4. TYPING. Double space everything, including footnotes.
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6. FOOTNOTES. Number consecutively throughout the paper.
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U.S. DEPARTMENT OF AGRICULTURE
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Washington, D.C. 20250

Official Business

AGRICULTURAL ECONOMICS RESEARCH

Is published quarterly by the Economic Research Service, U.S. Department of Agriculture. Use of funds for printing this publication approved by the Director of the Bureau of the Budget (February 3, 1969).

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. 40 cents a single copy, $1.50 a year domestic, $2.00 foreign.